LISTING OF THE CLAIMS

1-67. (Canceled).

68. (Previously Presented) A method of designing a direct expansion geothermal heat exchange system having a heating mode and a cooling mode, the method comprising:

providing an interior air heat exchanger;

providing an exterior, subterranean heat exchanger;

charging the system with a refrigerant so that the refrigerant has a head pressure in the cooling mode of approximately 305-405 psi, and a suction pressure in the heating mode of approximately 80-160 psi.

69. (Previously Presented) The method of claim 68, further comprising providing an R-410A refrigerant.

70. (Previously Presented) The method of claim 68, further comprising providing a polyolester oil in the direct expansion system.

71. (Previously Presented) The method of claim 68, further comprising providing a single piston metering device in the heating mode, with a pin restrictor (Aeroquip type) sizing as follows, based on central hole bore size in inches, utilized, plus or minus a maximum of two (2) one thousandths of an inch (0.001) central hole bore size, within the following depth ranges:

Maximum Heating Tonnage Design..........Pin Restrictor Central Bore Hole Size in Inches

*0 to 50 feet (depth of borehole below compressor unit)

1.5..0.041

2..0.049

2.5..0.055

3..0.059

3.5..0.063

4..0.065

4.5..0.068

5..0.071

*51 to 175 feet (depth of borehole below compressor unit)

1.5..0.039

2..0.047

2.5..0.052

3..0.056

3.5..0.060

4..0.062

4.5..0.065

5..0.067

*176 to 300 feet (depth of borehole below compressor unit)

1.5..0.037

2..0.044

2.5..0.050

3..0.053

3.5..0.057

4..0.059

4.5..0.061

5..0.064

72. (Previously Presented) The method of claim 68, further comprising providing, in the cooling mode, a self-adjusting thermostatic expansion valve which is located proximate to the interior heat exchanger and is sized at 140%, plus or minus 10% of 100%, of a maximum compressor tonnage design capacity in the cooling mode;

providing a single piston metering device situated proximate to the interior heat exchanger in the cooling mode, with a pin restrictor (Aeroquip type) sizing as follows, based on central hole bore size in inches, utilized, plus or minus a maximum of two (2) one thousandths of an inch (0.001) central hole bore size, within the following depth ranges:

Maximum Cooling Tonnage Design - Pin Restrictor Size in Inches

*0 to 50 feet (height of interior air handler above the compressor unit)

1.5..0.058

2	0.070
2.5	0.077
3	0.085
3.5	0.093
4	0.099
4.5	0.100
5	0.112

73. (Previously Presented) The method of claim 68, in which charging the system further includes obtaining a peak operational efficiency in the cooling mode with a superheat of approximately 10 to 25 degrees F, a head pressure in the heating mode of approximately 195 to 275 PSI, a suction pressure in the cooling mode of approximately 80 to 160 PSI, and a suction/vapor temperature of approximately 37 to 55 degrees F.

74-78. (Canceled).

79. (Previously Presented) A direct expansion geothermal heat exchange system having a heating mode and a cooling mode, the system comprising:

an interior air heat exchanger;

an exterior, subterranean heat exchanger; and

a refrigerant disposed in the system and sufficiently charged to have a head pressure in the cooling mode of approximately 305-405 psi, and a suction pressure in the heating mode of approximately 80-160 psi.

80. (Previously Presented) The system of claim 79, in which the refrigerant comprises an R-410A refrigerant.

81. (Previously Presented) The system of claim 79, further comprising a polyolester oil in the direct expansion system.

82. (Previously Presented) The system of claim 79, further comprising a single piston metering device in the heating mode, with a pin restrictor (Aeroquip type) sizing as follows, based on central hole bore size in inches, utilized, plus or minus a maximum of two (2) one thousandths of an inch (0.001) central hole bore size, within the following depth ranges:
Maximum Heating Tonnage Design..........Pin Restrictor Central Bore Hole Size in Inches
*0 to 50 feet (depth of borehole below compressor unit)
1.5..0.041
2..0.049
2.5..0.055
3..0.059
3.5..0.063
4..0.065
4.5..0.068
5..0.071

*51 to 175 feet (depth of borehole below compressor unit)
1.5..0.039

2...0.047
2.5..0.052
3...0.056
3.5..0.060
4...0.062
4.5..0.065
5...0.067

*176 to 300 feet (depth of borehole below compressor unit)
1.5..0.037
2...0.044
2.5..0.050
3...0.053
3.5..0.057
4...0.059
4.5..0.061
5...0.064

83. (Previously Presented) The system of claim 79, further comprising, in the cooling mode, a self-adjusting thermostatic expansion valve which is located proximate to the interior heat exchanger and is sized at 140%, plus or minus 10% of 100%, of a maximum compressor tonnage design capacity in the cooling mode;

providing a single piston metering device situated proximate to the interior heat exchanger in the cooling mode, with a pin restrictor (Aeroquip type) sizing as follows, based on central hole bore size in inches, utilized, plus or minus a maximum of two (2) one thousandths of an inch (0.001) central hole bore size, within the following depth ranges:
Maximum Cooling Tonnage Design - Pin Restrictor Size in Inches
*0 to 50 feet (height of interior air handler above the compressor unit)
1.5..0.058
2...0.070
2.5..0.077

3	0.085
3.5	0.093
4	0.099
4.5	0.100
5	0.112

84. (Previously Presented) The system of claim 79, further comprising charging the system with the refrigerant to obtain a peak operational efficiency in the cooling mode with a superheat of approximately 10 to 25 degrees F, a head pressure in the heating mode of approximately 195 to 275 PSI, a suction pressure in the cooling mode of approximately 80 to 160 PSI, and a suction/vapor temperature of approximately 37 to 55 degrees F.

85. (Previously Presented) A method of designing a direct expansion geothermal heat exchange system having a cooling mode and a heating mode, the method comprising:

providing an R-410A refrigerant; and

providing a single piston metering device in the heating mode, with a pin restrictor (Aeroquip type) sizing as follows, based on central hole bore size in inches, utilized, plus or minus a maximum of two (2) one thousandths of an inch (0.001) central hole bore size, within the following depth ranges:

Maximum Heating Tonnage Design..........Pin Restrictor Central Bore Hole Size in Inches

*0 to 50 feet (depth of borehole below compressor unit)

1.5..0.041

2..0.049

2.5..0.055

3..0.059

3.5..0.063

4..0.065

4.5..0.068

5..0.071

*51 to 175 feet (depth of borehole below compressor unit)

1.5..0.039

2..0.047

2.5..0.052

3..0.056

3.5..0.060

4..0.062

4.5..0.065

5..0.067

*176 to 300 feet (depth of borehole below compressor unit)

1.5..0.037

2..0.044

2.5..0.050

3..0.053

3.5..0.057

4..0.059

4.5..0.061

5..0.064

86. (Previously Presented) A method of designing a direct expansion geothermal heat exchange system having a cooling mode and a heating mode, the method comprising:

providing an R-410A refrigerant; and

charging the system with the refrigerant to obtain a peak operational efficiency in the cooling mode with a superheat of approximately 10 to 25 degrees F, a head pressure in the heating mode of approximately 195 to 275 PSI, a suction pressure in the cooling mode of approximately 80 to 160 PSI, and a suction/vapor temperature of approximately 37 to 55 degrees F.

87. (Previously Presented) A method of designing a direct expansion geothermal heat exchange system having a cooling mode and a heating mode, the method comprising:

providing a refrigerant with heating/cooling operational working pressures between 80 psi and 405 psi; and

providing a single piston metering device in the heating mode, with a pin restrictor (Aeroquip type) sizing, based on central hole bore size in inches, utilized, plus or minus a maximum of two (2) one thousandths of an inch (0.001) central hole bore size, within the following depth ranges:

Maximum Heating Tonnage Design.........Pin Restrictor Central Bore Hole Size in Inches

*0 to 50 feet (depth of borehole below compressor unit)

1.5...0.041

2..0.049

2.5...0.055

3..0.059

3.5...0.063

4..0.065

4.5...0.068

5..0.071

*51 to 175 feet (depth of borehole below compressor unit)

1.5...0.039

2..0.047

2.5...0.052

3..0.056

3.5...0.060

4..0.062

4.5...0.065

5..0.067

*176 to 300 feet (depth of borehole below compressor unit)

1.5...0.037

2	0.044
2.5	0.050
3	0.053
3.5	0.057
4	0.059
4.5	0.061
5	0.064

88. (Previously Presented) A method of designing a direct expansion geothermal heat exchange system having a cooling mode and a heating mode, the method comprising:

providing a refrigerant with heating/cooling operational working pressures between 80 psi and 405 psi; and

charging the system with the refrigerant to obtain a peak operational efficiency in the cooling mode with a superheat of approximately 10 to 25 degrees F, a head pressure in the heating mode of approximately 195 to 275 PSI, a suction pressure in the cooling mode of approximately 80 to 160 PSI, and a suction/vapor temperature of approximately 37 to 55 degrees F.

89. (Previously Presented) A method of designing a direct expansion geothermal heat exchange system having a cooling mode and a heating mode, the method comprising:

providing an interior air heat exchanger;

providing an exterior, subterranean heat exchanger, the exterior heat exchanger including heat exchange tubing, at least a portion of the heat exchange tubing having a subterranean depth of approximately 100-300 feet; and

charging the system with an R-410A refrigerant until the refrigerant has a head pressure in the cooling mode of approximately 305-405 psi, and a suction pressure in the heating mode of approximately 80-160 psi.

90. (Previously Presented) A direct expansion geothermal heat exchange system having a cooling mode and a heating mode, the system comprising:

an interior air heat exchanger;

an exterior, subterranean heat exchanger, the exterior heat exchanger including heat exchange tubing, at least a portion of the heat exchange tubing having a subterranean depth of approximately 100-300 feet; and

an R-410A refrigerant disposed in the system, the R-410A refrigerant having a charge sufficient to obtain a head pressure in the cooling mode of approximately 305-405 psi, and a suction pressure in the heating mode of approximately 80-160 psi.